Exploring trade-offs between irrigation and other water-related services in a mediterranean watershed: a deliberative valuation approach

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EXPLORING TRADE-OFFS BETWEEN IRRIGATION AND OTHER WATER-RELATED SERVICES IN A MEDITERRANEAN WATERSHED: A DELIBERATIVE VALUATION APPROACH

COMPROMIS ENTRE IRRIGATION ET AUTRES SERVICES DES HYDROSYSTEMES DANS UN BASSIN-VERSANT MEDITERRANEEN : UNE APPROCHE D'EVALUATION DELIBERATIVE

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ABSTRACT

In Southern France, the objective of good ecological status for all water bodies in 2015 has led to revising water abstraction authorizations for all uses, including irrigation, leading to conflicts among users and with water management authorities. An ecosystem services approach is proposed in order to assess current and potential benefits of aquatic ecosystems and identify trade-offs and synergies between them. It is combined with a monetary deliberative valuation method to account for the plurality of values people hold for water-related ecosystem services. The research question addressed in the paper is whether and how deliberation influences these individual values. The approach is applied to the Gardons' river catchment (south east of France), confronted with quantitative and qualitative water management problems, as well as flash floods and river restoration issues.

RÉSUMÉ

Dans le Sud de la France, l'objectif d'atteinte du bon état écologique pour toutes les masses d'eau à l'horizon 2015 a conduit à la révision des autorisations de prélèvements en eau pour tous les usages, y compris l'irrigation, suscitant des conflits entre les usagers et avec les autorités de gestion de l'eau. Une approche en termes de services écosystémiques est proposée pour évaluer les bénéfices actuels et potentiels des milieux aquatiques et identifier les compromis et les synergies existant entre eux. Cette approche est combinée avec une technique d'évaluation délibérative pour tenir compte de la pluralité des valeurs que les personnes attachent aux services écosystémiques liées à l'eau. Ce papier cherche à mesurer si et comment la délibération influence ces valeurs individuelles. L'approche est appliquée au cas du bassin des Gardons dans le sud-est de la France, confronté à des problèmes de gestion quantitative et qualitative de la ressource en eau, ainsi qu'à des questions de crues éclair et de restauration de rivière.

Keywords: irrigation; water-related ecosystem services; deliberative valuation; choice experiment; Gardons

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1. Introduction

After an important expansion until 2000, irrigated areas in France (1.57 million of hectares in 2010), and associated water abstractions, are now stabilized (Loubier et al., 2013. However, irrigation, which is accounting for almost 50% of net consumption (around 3x106 m3 per year), and 10 to 15% of total abstractions, is still the main water use in France (Roy, 2013). Furthermore, the concentration of irrigation water abstractions during low flow periods and in the central and southern parts of the country is causing important tensions between uses in many catchments. Drought crisis management is systematically implemented every year in 18 districts mainly located in the south-western part of the country. The objective of good ecological status for all water bodies in 2015, imposed by the Water Framework directive (WFD), has led to the revision of water abstraction authorizations for all uses, including irrigation, when the balance between available resources and water demand is not ensured. These revisions are based on standardized approaches to assess environmental flows, which often ignore the reality of water uses in the watersheds and how local communities value them, leading to conflicts among users and with water management authorities.

In this context, it seems important to compare economic benefits related to irrigation (agricultural production, farm and agri-business jobs), environmental costs due to excessive water abstractions, and more generally environmental impacts of irrigation. In this paper, an ecosystem services approach is advocated in order to holistically assess current and potential benefits of aquatic ecosystems and identify trade-offs and synergies between them. Furthermore the proposed approach seeks to account for the plurality of values people hold for aquatic ecosystems, by combining a conventional economic valuation technique with a deliberative process.

2. Ecosystem services and deliberative valuation

2.1 Ecosystem services approach

The concept of ecosystem services (ES), mainstreamed by the Millennium Ecosystem Assessment, has emerged from the increasing acknowledgement of the usefulness of ecosystems for society and the need to protect and manage them. ES have been defined as “benefits humans derive from nature” (Millennium Ecosystem Assessment, 2005) or “the direct and indirect contributions of ecosystems to human well-being” (de Groot et al., 2009). While focusing on the contribution of ecosystems, the ES framework also recognizes that the provision of actual services may require the incorporation of anthropogenic capital (human work and physical capital build by human-beings).

The Ecosystem Services Approach (ESA), developed for the implementation of the Convention on Biological Diversity (CBD), aims to reach a balance between three objectives: conservation of biodiversity; its sustainable use; and equitable sharing of benefits arising from the utilization of natural resources. Although the WFD does not explicitly refer to ES, there is a convergence between ESA and WFD principles (Hartje and Klaphake, 2006). Indeed, the good ecological status of water bodies can be considered as a prerequisite for essential ecological functions at the basis of water-related ES (Vlachopoulou et al., 2014). Applying an ESA in water management allows a more holistic and systemic analysis of all present and potential direct water uses, as well as benefits provided by aquatic ecosystem functioning. It also enables the consideration of temporal dynamics of ES and the complementarities or competitions between water uses. It encourages moving from a management focused on legal compliance towards the effective supply of ES. It also helps communicating the intentions and objectives of the WFD. Finally it improves the economic justification of water management plans and helps developing incentives to support the WFD implementation.

2.2 Plurality of values

In neoclassical economic theory, the value of goods and services derives from the utility they provide to individuals. Preferences are assumed to be strictly individual and rational. As such, collective preferences are conceptualized as the sum of all the individual preferences. In this framework, money is a practical metric to quantify the value of non-market goods. However, these assumptions are increasingly challenged since the 2000’s. Multiple dimensions of values are recognized, although they are not always easy to define, observe and measure. The concepts of shared or social values have been recently proposed to designate non utilitarian dimensions of ecosystem values articulated by groups of people in the frame of social processes. In this study we take on the operational framework proposed for the United Kingdom Millennium Ecosystem Impact Assessment (Kenter et al., 2014), which consider five dimensions to values: i) whether the values are general4 or specific to a context; ii), who is the value provider (individual, group, community, society); iii) how they are elicited (in a deliberative way or not); iv) which scale they represent (societal or individual); and v) what is their intention (self-regarding or other regarding). Hence, values elicitation can be channeled not only through quantitative methods, but also qualitative ones.

[4] General or transcendental values are defined as conceptions about desirable end states or behaviors that transcend specific situations and guide selection or evaluation of behavior and events (Schwartz and Bilsky, 1987).

2.3 Instrumental versus deliberative ES valuation

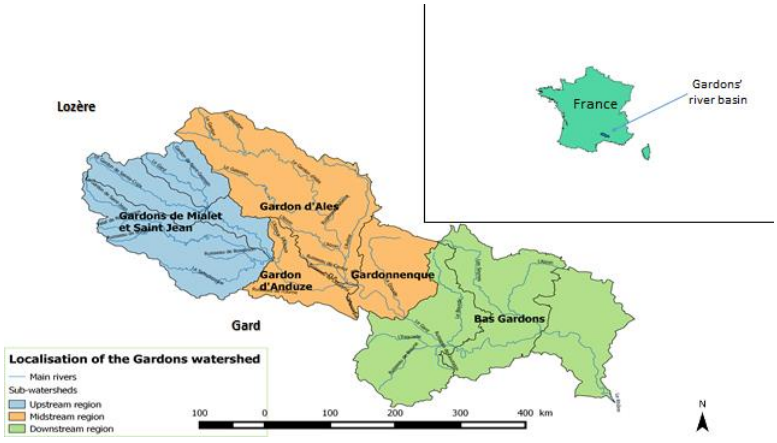
The neoclassical conception of values has led to the development of several instrumental valuation methods that capture the Willingness to Pay (WTP) or Willingness to Accept (WTA) of individuals for changes in the provision of environmental goods (Raymond et al., 2014). However, these methods are increasingly criticized for failing to take into account preference uncertainties or social interactions (Hitlin & Piliavin, 2004), or to encompass the multiple dimensions of values (Spash, 2008; Wegner and Pascual, 2011). This tends to underestimate the scope of benefits provided by ecosystems (Chan et al., 2012).

Mixed valuation methods of environmental goods, combining qualitative and quantitative techniques, are thus being developed to overcome the limitations of convention approaches (Raymond et al., 2014). In particular, assuming that preferences over environmental goods and services may be formed through a process of social exchange, deliberative approaches are advocated (Kenter et al., 2014). During the process, participants involved as a formal group or citizen juries are invited to argue in an opening way about their perceptions of ecosystem services and hence express the plural values they hold for them. The objective of this social interaction exchange is to make more explicit the norms and ethical views related to nature and to identify the group shared values, including socio-cultural identity attached to some ecosystem components or functions. From the practical perspective of public policy, one of the advantages of deliberative approaches is that they provide more legitimacy to environmental actions.

Two main types of deliberative-instrumental approaches are described in the literature: deliberative monetary valuation (DMV) (Spash, 2007; Kenter et al., 2014) combines deliberative exercises with stated preferences techniques (contingent valuation or choice experiment), whereas *deliberative multicriteria assessment* (MCA) includes deliberation into a standard multicriteria analysis (for example Proctor and Drechsler, 2006). Both approaches allow the expression of the social willingness to pay (or accept), defined as a “fair price” to maintain benefits delivered by the ecosystems to society as whole.

3. Case study : The Gardons’ watershed, South-east of France

The Gardons’ watershed, located in south east of France, includes 172 local municipalities, covering a total area of 2030 km^2 (Figure 1). The Gardons refers to a number of streams originating in the Cévennes mountainous area, which flow across the Gard District, and then into the Rhône River. Around 203,250 people reside in the area (population census, 2010). Covered by 70% of forest and semi-natural landscapes, the area hosts charismatic and valuable animal species. The Gardons’ watershed includes 12 Natura 2000 areas, as well as several nature reserves and conservation parks. It also hosts some cultural heritage sites such as the renowned Pont du Gard aqueduct, which attracts more than one million of tourists per year. Besides, part of the attractiveness of the area for tourism (70,600 visitors in 2005) lies in the water-related recreation activities such as swimming, canoeing or recreational fishing. Hence, tourism and recreation in the Gardons form the base of a service economy providing about 71% of total jobs (SMAGE des Gardons, 2013).



The Gardons territory assets are however under threat due to natural processes and anthropic pressures. Irregular rainfall concentrated on a brief period (50 days a year) leading to natural summer low flows and recurring flash floods during autumn, is typical of the Gardons’ watershed climate. Such natural vulnerability is intensified by a high level of water abstraction mainly for domestic, agricultural and industrial uses. If domestic use is the overall main use all year round, irrigation is responsible for a large portion of gross water abstraction during the summer months.

Figure 1: Map of the Gardons’ catchment

Irrigated agricultural production ranges from extensive livestock farming, supplied from centuries-old irrigation canals in the upstream part of the basin, to intensive fruit and quality grape production using pumped groundwater, in the plain.

The combination of over-extraction of water and the variability of river flow regime is heavily impacting both resource availability and quality. Moreover, water quality is also affected by pollution, due to former mining industries in the midstream part of the catchment and to intensive use of agricultural pesticides in the downstream part. These problems are likely to be compounded in the future by the increasing population and impacts of climate change. Tensions over water resource is then expected considering increasing water scarcity while both local and tourist population will reach around 27,000 and 73,700 respectively by 2020-2025 (SMAGE des Gardons, 2013).

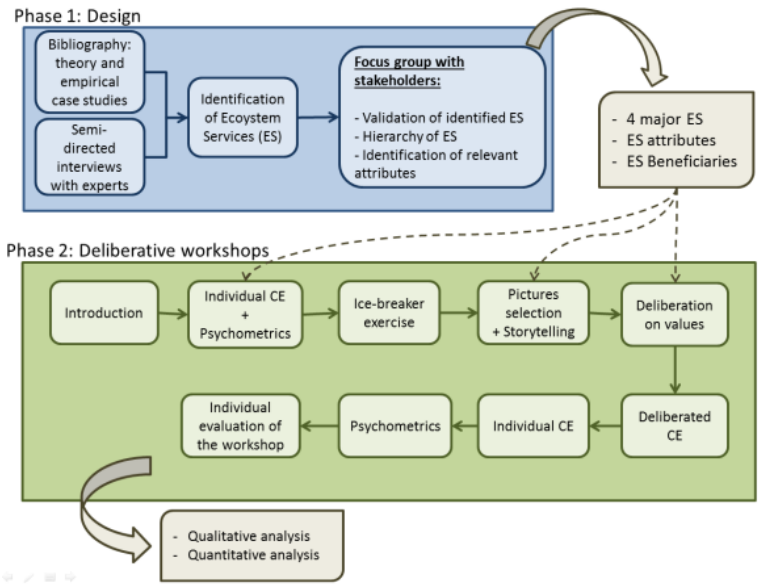
4. A deliberative valuation approach

The main research question we want to address in this study is whether and how deliberation influences the values expressed by individuals regarding water-related ecosystem services. Hence, the paper aims to contribute to the emerging literature on ecosystem services deliberative valuation in two ways. Firstly, it helps to test some of hypotheses on the role of deliberation in ES value formation. Secondly, it represents, to our knowledge, the first implementation of a deliberative monetary valuation approach to water-related ecosystem services in France.

Inspired by the theory of planned behavior (Ajzen, 1991) and the Value-Belief-Norm theory of environmental behavior (Stern et al., 1999; Stern, 2000), cited by Kenter et al. (2014), we elaborated a conceptual framework to explain how individual values might be influenced by deliberation. Three hypotheses are tested:

1. As deliberation enables participants to exchange information and ideas, it can influence participants' representations about aquatic ecosystems status and their capacities to provide ecosystem services.
2. Deliberation has an impact on individual transcendental values[5], which in turn influence preferences held towards water management choices.
3. Deliberated social values differ from individual values. In other words, social preferences are different from the sum of individual values.

Our protocol comprises two major phases. The first phase conducted from April to July 2015, consisted in designing the deliberation process based on interviews and a workshop with experts and Gardons' stakeholders. Deliberative workshops with local inhabitants were implemented during the second phase (September to October 2015) (Figure 2).



11 experts of different backgrounds and political sensitivity were interviewed in order to identify relevant ecosystems services in the catchment (Regional office of the Ministry of Ecology (DREAL), Water Agency, river management institution, technical staff of farmers' professional organization, municipal and district level councilors, and consumer association). Based on these preliminary interviews, 13 ES were identified among an initial generic list of 24 water-related ES, and then validated and prioritized by importance during a workshop with members of the local water commission (which regroups the different stakeholders of the Gardons). The resulting material was then used as building blocks for the choice experiment questionnaire as well as for the selection of pictures representing the different ES, which were used during the workshops.

Figure 2. The deliberative monetary valuation approach undertaken in the Gardon's catchment

During valuation workshops organized in the different parts of the watershed, small groups of inhabitants were asked to express their preferences upon different bundles of river ecosystem services (ES), individually, and as a group, before and after a moderated group discussion. Participants were asked to select 2 pictures among the pile collected at the end of the design phase, and explain to the audience why they considered the ES represented on the picture were important for their well-being. Participants were invited next to relate their preferences regarding river ES to the transcendental values and world visions that should guide decisions upon the Gardons' river management. Individual transcendental values and representations about the river status and related ES were also assessed through individual psychometric questionnaires before and after the deliberation. Results from the workshops will be analyzed using quantitative and qualitative techniques.

4 Conclusion

This study is still in progress. Through the implementation of this deliberative valuation protocol, we expect to measure the importance given by the inhabitants or visitors of the Gardons' catchment to water-related ES and to relate this importance

[5] Transcendental values are defined as the conceptions about desirable end states or behaviors that transcend specific situations and guide selection or evaluation of behaviors and events (Schwartz and Bilsky, 1987, cited by Kenter *et al.*, 2014).

to more deeply-held worldviews. By comparing individual choices before and after the deliberation process, we intend to assess the role played by deliberation in the formation of those individual values and to what extent these values are shared among the population.

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